Halo measurements for hollow-beam collimation

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Tevatron Department Meeting
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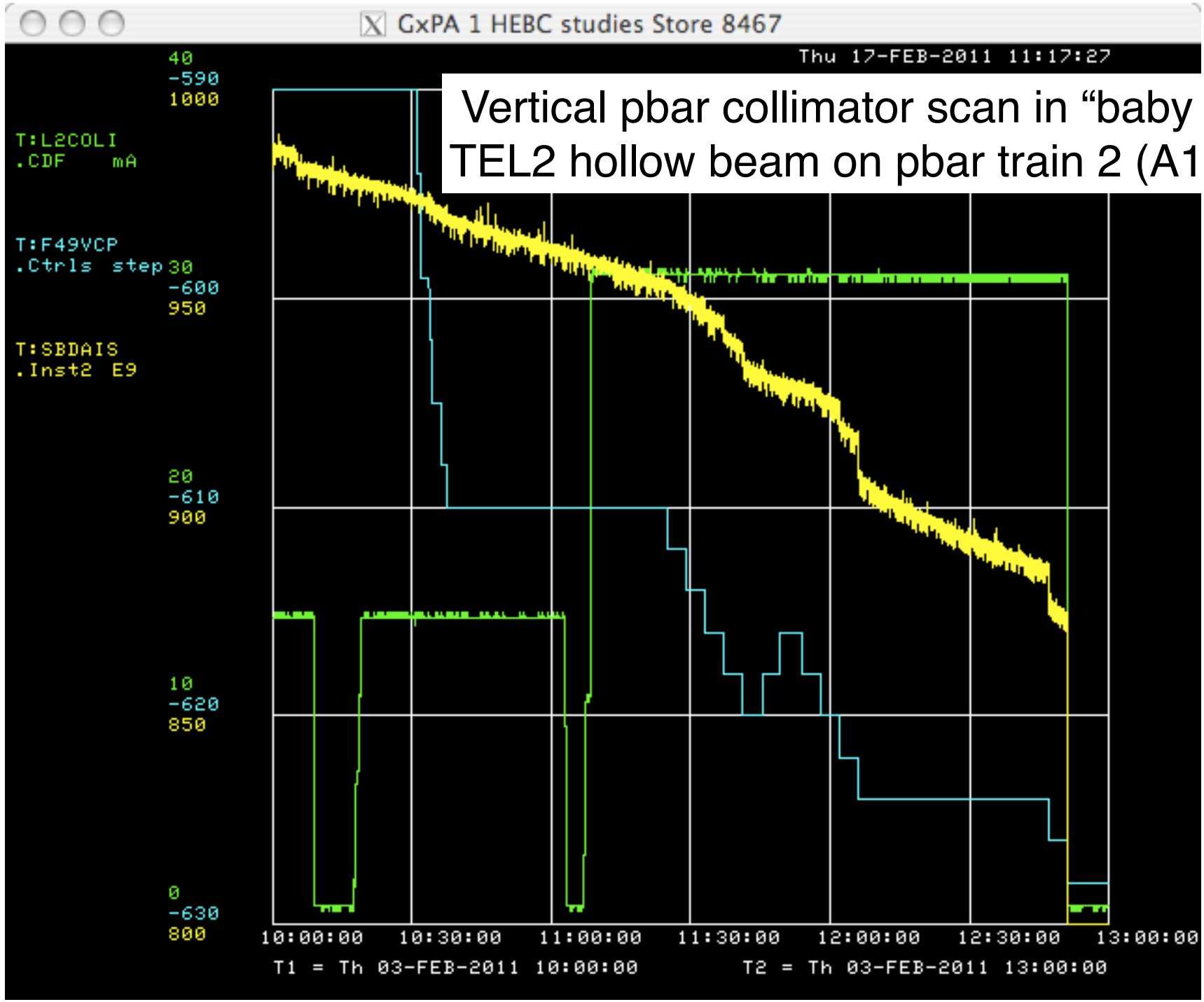
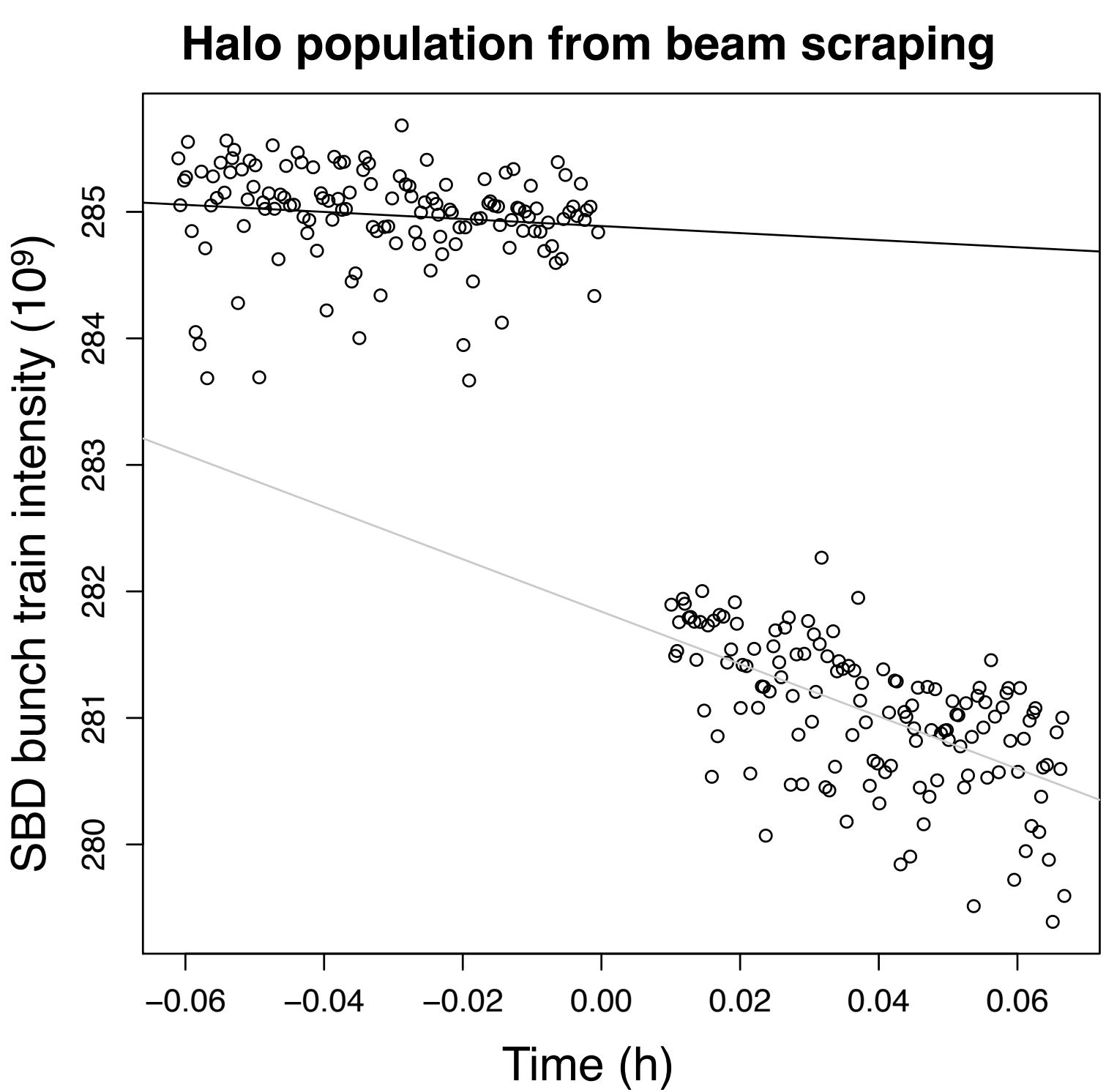
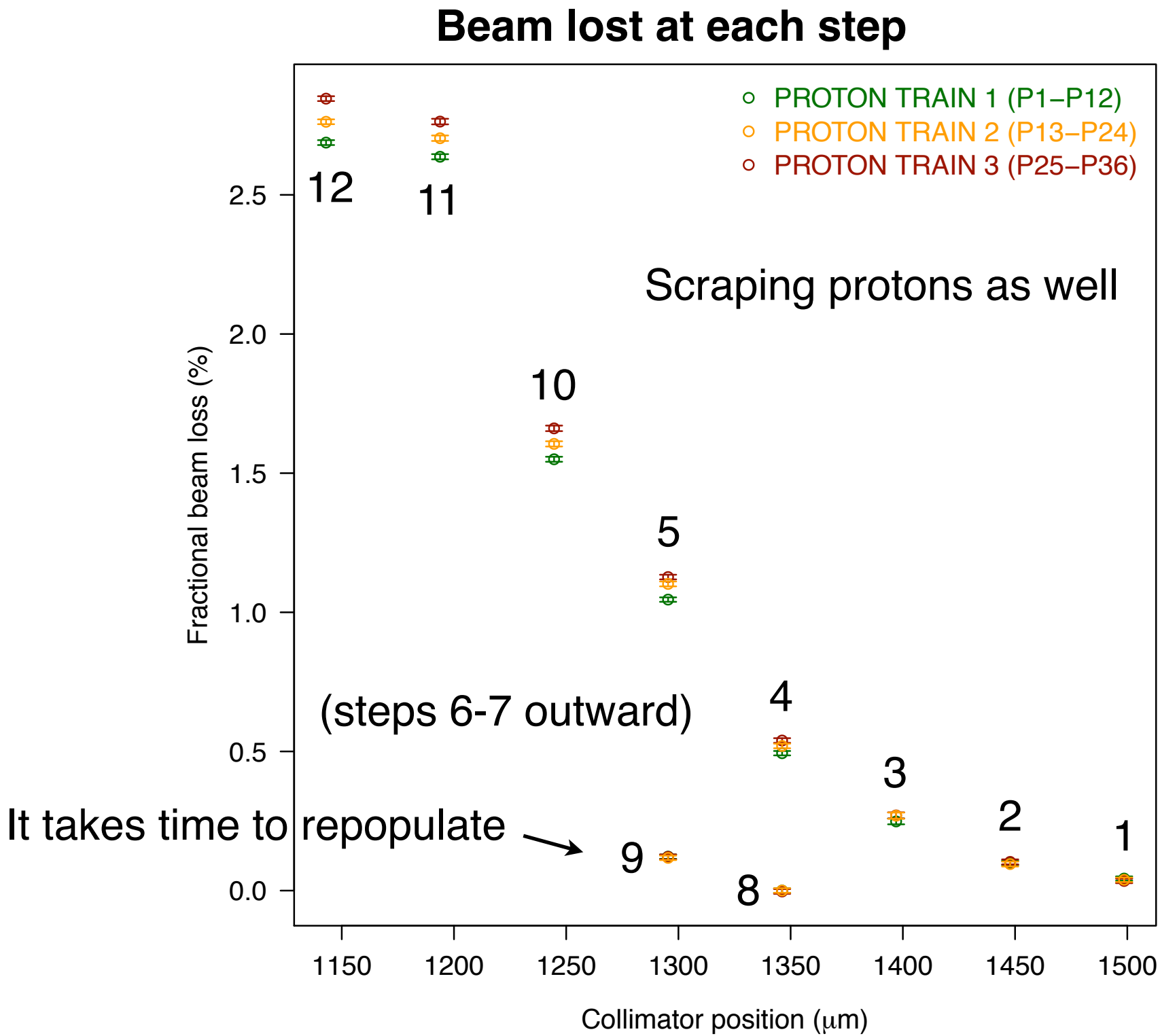
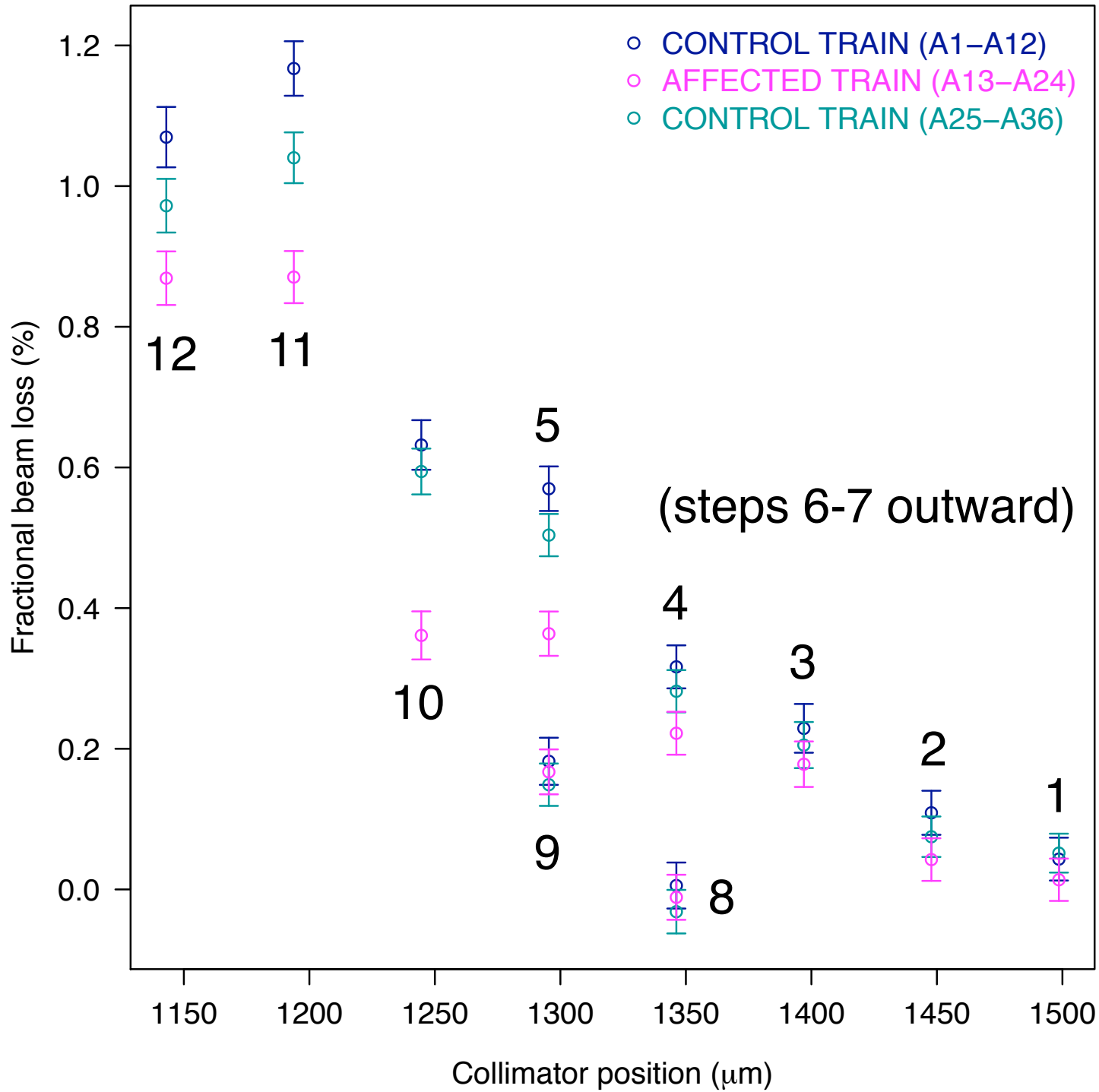

GxPA 1 HEBC studies Store 8467
Thu 17-FEB-2011 11:17:27
Vertical pbar collimator scan in “baby steps”
TEL2 hollow beam on pbar train 2 (A13-A24)
T:L2COLI
.CDF mA
40
-590
1000
T:F49VCP
.Ctrls step
30
-600
950
T:SBDAIS
.Inst2 E9
20
-610
900
10
-620
850
0
-630
800
10:00:00
10:30:00
11:00:00
11:30:00
12:00:00
12:30:00
13:00:00
T1 = Th 03-FEB-2011 10:00:00
T2 = Th 03-FEB-2011 13:00:00

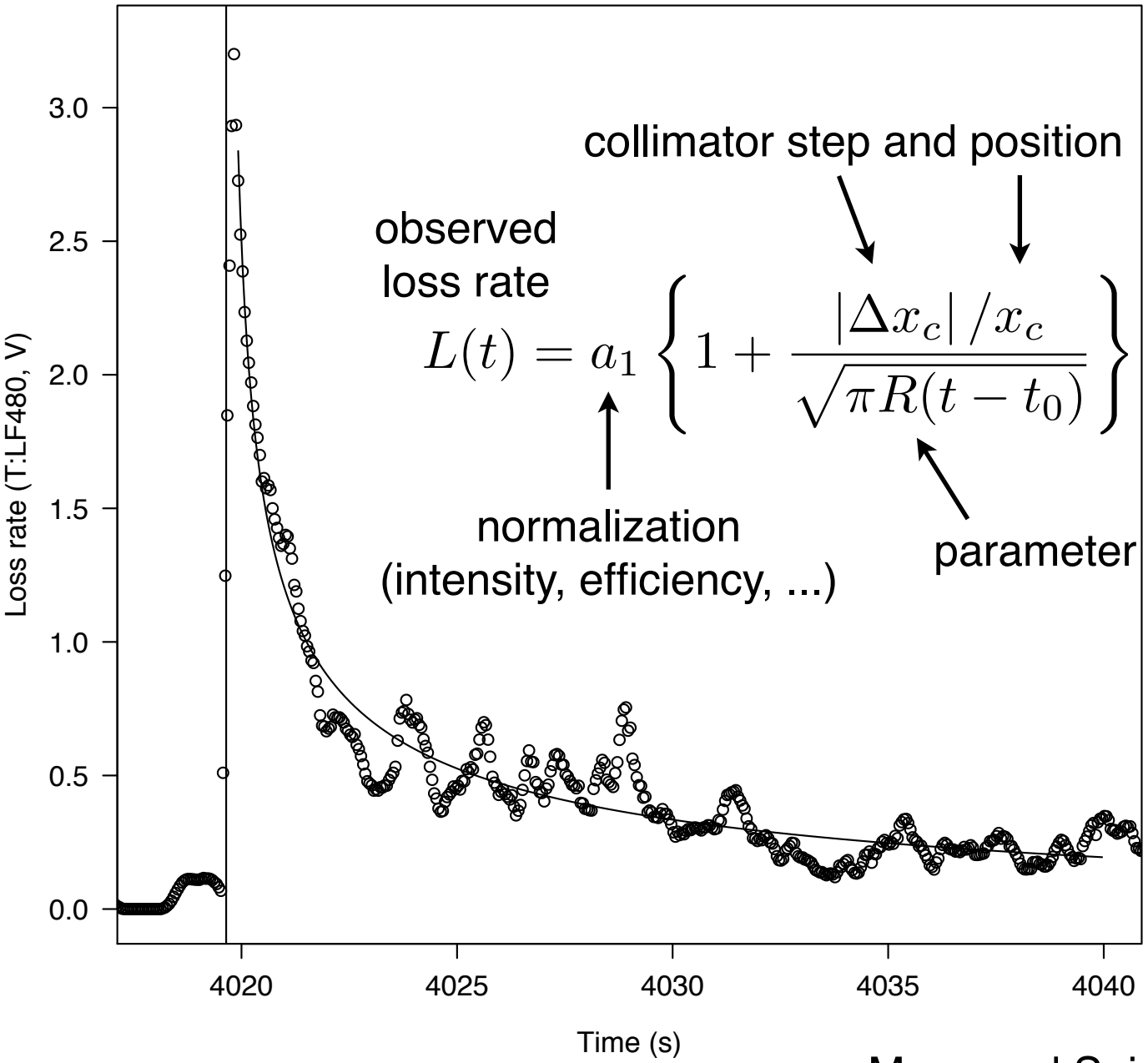

Halo population from beam scraping
SBD bunch train intensity (10^9)
280
281
282
283
284
285
−0.06
−0.04
−0.02
0.00
0.02
0.04
0.06
Time (h)


Beam lost at each step
PROTON TRAIN 1 (P1–P12)
PROTON TRAIN 2 (P13–P24)
PROTON TRAIN 3 (P25–P36)
Fractional beam loss (%)
0.0
0.5
1.0
1.5
2.0
2.5
12
11
10
5
4
3
2
1
9
8
Scraping protons as well
(steps 6-7 outward)
It takes time to repopulate
1150
1200
1250
1300
1350
1400
1450
1500
Collimator position (μm)

Affected pbar train has lower halo population



Diffusion rate vs. amplitude from time evolution of local losses



collimator step and position

observed loss rate

$$L(t) = a_1 \left\{ 1 + \frac{|\Delta x_c| / x_c}{\sqrt{\pi R (t - t_0)}} \right\} + a_0$$

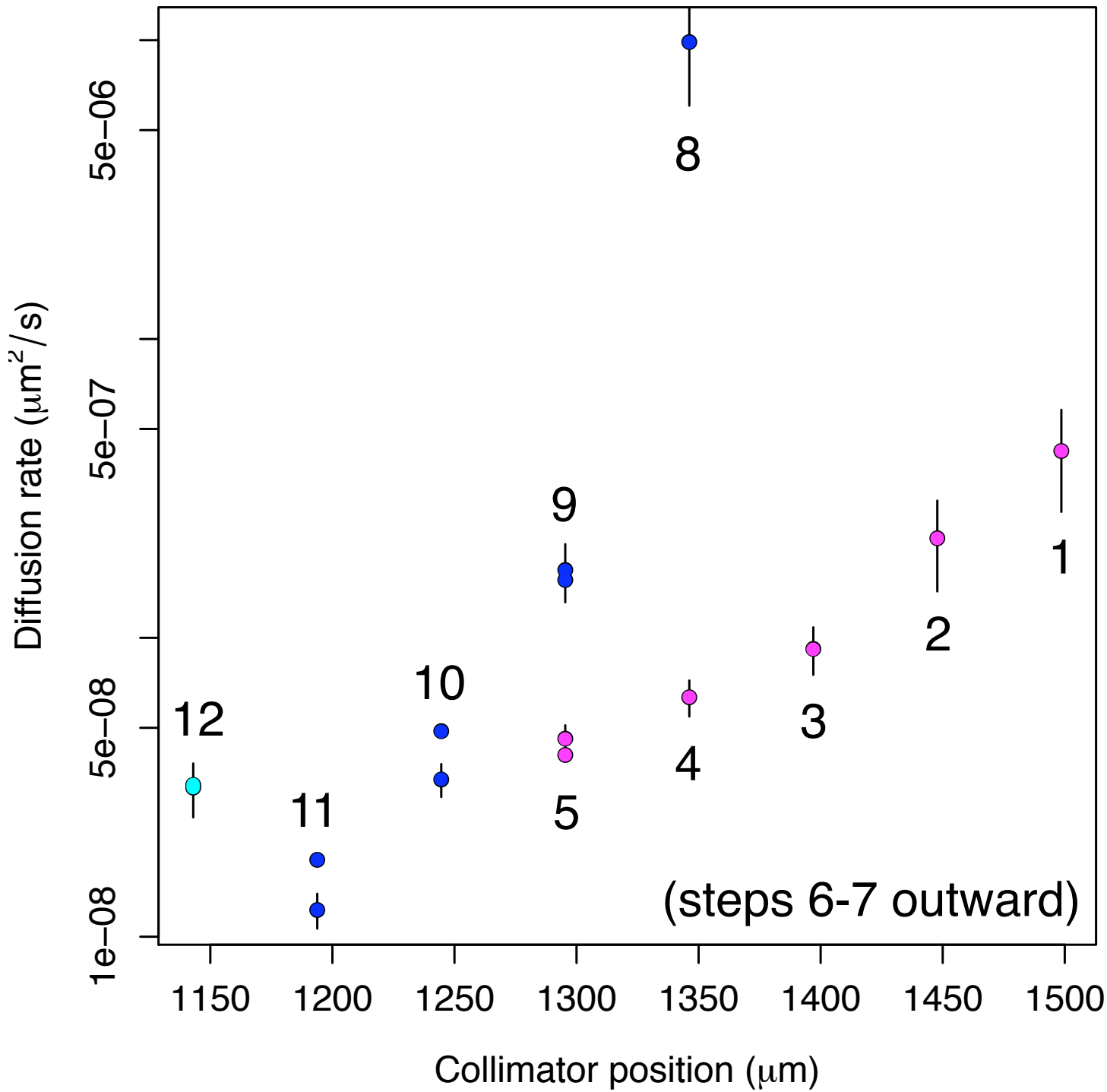
background

normalization (intensity, efficiency, ...)

parameter related to diffusion rate

$$D = R \cdot x_c^4 / \beta_c^2$$

Mess and Seidel, NIM A 351, 279 (1994)


Diffusion rate (μm²/s)
1e−08
5e−08
5e−07
5e−06
1150
1200
1250
1300
1350
1400
1450
1500
Collimator position (μm)
12
11
10
9
8
5
4
3
2
1
(steps 6-7 outward)

Collimator “baby steps” with e-lens on/off done yesterday (EOS 8508).
Data being analyzed.

Started looking at effect of HEBC on loss spikes.

Need opportunistic extinction measurement to determine collimator distance from beam axis.
1 transfer at 150 GeV should work.